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TRANSMITTAL OF APPEAL BRIEF (Large Entity)	Docket No. BUR920010174US1

In Re Application Of: **Bunt et al.**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
10/064,317	**7/2/2002**	**Guerrero, Maria F.**	**30449**	**2822**	

Invention: **PROGRAMMABLE ELEMENT WITH SELECTIVELY CONDUCTIVE DOPANT AND METHOD FOR PROGRANMMABLE SAME**

COMMISSIONER FOR PATENTS:

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed on

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DOCKET NO. BUR920010174US1

THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Bunt *et al.* Examiner: Guerrero, Maria F.

Serial No.: 10/064,317 Art Unit: 2822

Filed: 07/02/2002

For: **PROGRAMMABLE ELEMENT WITH SELECTIVELY CONDUCTIVE DOPANT AND METHOD FOR PROGRAMABLE SAME**

Commissioner for Patents
P.O. Box 1450
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BRIEF OF APPELLANT

This Appeal Brief, pursuant to the Notice of Appeal filed September 9, 2004, is an appeal from the rejection of the Examiner dated June 29, 2004.

REAL PARTY IN INTEREST

International Business Machines, Inc. is the real party in interest.

RELATED APPEALS AND INTERFERENCES

None.

STATUS OF CLAIMS

Claims 27-36 are currently pending.

STATUS OF AMENDMENTS

There are no After-Final Amendments which have not been entered.

SUMMARY OF INVENTION

The present invention discloses a method of selecting a specific precise resistance in a programmable element that comprises a semiconductor material within a semiconductor substrate. The semiconductor material is doped with a dopant that decreases said resistance when said element is exposed to actinic radiation for a first length of time. See Paragraph 20, lines 1-3. The radiation causes substantially no mechanical deformation of said element. See Paragraph 22, lines 20-22.

A test resistance value of said programmable element is determined and compared to said specific precise resistance. If said test resistance value does not equal said specific precise resistance, said programmable element is exposed to said actinic radiation for said first length of time and said steps of determining and comparing said resistance values are repeated. See Paragraph 37, lines 6-9.

A layer is formed on the semiconductor material, wherein the layer comprises a cap portion that includes an insulative material and a conductive contact, such that the cap portion and the conductive contact are each in direct mechanical contact with the semiconductor material. See Paragraph 22, lines 1-6. During each said exposing the actinic radiation strikes an uncovered surface of the cap portion, passes through the insulative material of the cap portion, and propagates into the programmable element.. See Paragraph 34, lines 1-2. The doping step may be performed before or after the step of forming a layer. See steps 40-42 of FIG. 3 and

Paragraphs 25-26.

The method cap portion of the layer may include silicon dioxide or silicon nitride. See Paragraph 21, lines 8-9.

The actinic radiation may be laser radiation, and wherein each said exposing comprises exposing said programmable element with said laser radiation for said first length of time which results in heating said programmable element to an elevated temperature such that the dopant is activated so as to cause an electrical resistance of the programmable element to decrease. See Paragraph 34, lines 5-8.

After said comparing determines that the resistance value equals said specific precise resistance, the programmable element is rapidly cooled from the elevated temperature to an operating temperature. See Paragraph 34, lines 11-16 - Paragraph 35, lines 1-5.

Shallow trench isolation may be provided within the semiconductor material for isolating the programmable element within the semiconductor material.. See Paragraph 29, lines 1-3.

The laser radiation may have a wavelength such that the laser radiation is essentially unabsorbed by the cap portion of the layer, and the laser radiation may have a wavelength in a range of 248 nanometers to 1107 nanometers. See Paragraph 36, lines 5-8.

ISSUES

1. Whether claims 27-29, 31, and 34-35 are unpatentable under 35 U.S.C. §102(b) over Jones, Jr. et al. (U.S. 4,835,118).

2. Whether claims 30, 32-33 and 36 are unpatentable under 35 U.S.C. §103(a) over Jones, Jr. et al. (U.S. 4,835,118) in view of Mehta et al. (U.S. 5,795,627).

GROUPING OF CLAIMS

The claims are grouped as shown in Table 1.

Table 1.

Group	Issue	Claims	Do Claims of Group Stand or Fall Together?
1	1	27-28	Yes
2	1	29, 31, and 34-35	No
3	2	30, 32-33 and 36	No

Claim 29 does not stand or fall together with claims 27-28, because claim 29 requires resolution of the following question not pertinent to claims 27-28: Whether Jones, Jr. teaches the feature: "wherein the doping step is performed after the step of forming a layer".

Claim 31 does not stand or fall together with claims 27-29, because claim 31 requires resolution of the following question not pertinent to claims 27-29: Whether Jones, Jr. teaches the feature: "wherein the laser radiation has a wavelength such that the laser radiation is essentially unabsorbed by the cap portion of the layer".

Claim 34 does not stand or fall together with claims 27-29 and 31, because claim 34 requires resolution of the following question not pertinent to claims 27-29 and 31: Whether Jones, Jr. teaches the feature: "wherein the method further comprises rapidly cooling the programmable element from the elevated temperature to an operating temperature".

Claim 35 does not stand or fall together with claims 27-29, 31,and 34, because claim 35

requires resolution of the following question not pertinent to claims 27-29, 31, and 34: Whether Jones, Jr. teaches the feature: "wherein the step of forming a layer includes forming a conductive contact within the layer, wherein the conductive contact is in direct mechanical contact with the cap portion and with the semiconductor substrate".

The claims of Group 3 do not stand or fall together with the claims of Groups 1-2, because the claims of Group 3 were rejected under 35 U.S.C. §103(a), whereas the claims of Group 1-2 were rejected under 35 U.S.C. §102(b).

Claim 32 does not stand or fall together with claim 30, because claim 32 requires resolution of the following question not pertinent to claim 30: Whether Jones, Jr. in view of Mehta teaches or suggests the feature: "wherein the cap portion of the layer includes silicon dioxide".

Claim 33 does not stand or fall together with claims 30 and 32, because claim 33 requires resolution of the following question not pertinent to claims 30 and 32: Whether Jones, Jr. in view of Mehta teaches or suggests the feature: "wherein the cap portion of the layer includes silicon nitride".

Claim 36 does not stand or fall together with claims 30 and 32-33, because claim 36 requires resolution of the following question not pertinent to claims 30 and 32-33: Whether Jones, Jr. in view of Mehta teaches or suggests the feature: "wherein the providing step includes providing shall trench isolation within the semiconductor substrate for isolating the programmable element region within the semiconductor substrate".

ARGUMENT

Issue 1
CLAIMS 27-29, 31, AND 34-35 ARE NOT UNPATENTABLE UNDER 35 U.S.C. §102(b) OVER JONES, JR. ET AL. (U.S. 4,835,118).

The Examiner rejected claims 27-29, 31, and 34-35 under 35 U.S.C. §102(b) as allegedly being anticipated by Jones, Jr. et al. (U.S. 4,835,118).

Claim 27

Appellants respectfully contend that Jones, Jr. does not anticipate claim 27, because Jones, Jr. does not teach each and every feature of claim 27. For example, Jones, Jr. does not teach the feature: "providing a semiconductor substrate having a semiconductor material therein, wherein the semiconductor substrate includes a programmable element region having the programmable element, and wherein the programmable element comprises the semiconductor material".

The language of the preceding feature of claim 27 requires that the semiconductor substrate and the programmable element comprise the same semiconductor material. Although Jones discloses that the programmable element 44 comprises polysilicon, Jones does not disclose that the semiconductor substrate 26 contains polysilicon or even silicon.

In "Response to Arguments", the Examiner states: "In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the semiconductor substrate and the programmable element comprise the same semiconductor material) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification

are not read into the claims."

In response to the Examiner's "Response to Arguments", Appellants respectfully contend that the phrase "the semiconductor material" in the feature "wherein the programmable element comprises **the semiconductor material**" (emphasis added) of claim 27 has antecedent basis in the phrase "a semiconductor material" in the feature "providing a semiconductor substrate having **a semiconductor material** therein"(emphasis added) of claim 27. Therefore, by the legally valid rules of claim construction, claim 27 recites that the semiconductor material comprised by the programmable element is the same semiconductor material that is comprised by the semiconductor substrate. Appellants are relying on claim construction, and not on the specification, with respect to the preceding interpretation of claim 27.

Based on the preceding argument, Appellants respectfully maintain that Jones, Jr. does not anticipate claim 27, and that claim 27 is in condition for allowance

Claim 28

Since claim 28 depends from claim 27, which Appellants have argued *supra* to not be unpatentable over Jones, Jr. under 35 U.S.C. §102(b), Appellants maintain that claim 28 is likewise not unpatentable over Jones, Jr. under 35 U.S.C. §102(b).

Claim 29

Since claim 29 depends from claim 27, which Appellants have argued *supra* to not be unpatentable over Jones, Jr. under 35 U.S.C. §102(b), Appellants maintain that claim 29 is likewise not unpatentable over Jones, Jr. under 35 U.S.C. §102(b).

In addition with respect to claim 29, Jones does not disclose the feature: "wherein the doping step is performed after the step of forming a layer".

Moreover, since the Examiner has not presented any argument with respect to the preceding feature of claim 29, Appellant maintains that the rejection of claim 29 under 35 U.S.C. §102(b) is improper.

Claim 31

Since claim 31 depends from claim 27, which Appellants have argued *supra* to not be unpatentable over Jones, Jr. under 35 U.S.C. §102(b), Appellants maintain that claim 31 is likewise not unpatentable over Jones, Jr. under 35 U.S.C. §102(b).

In addition with respect to claim 31, Jones does not disclose the feature: "wherein the laser radiation has a wavelength such that the laser radiation is essentially unabsorbed by the cap portion of the layer".

Moreover, since the Examiner has not presented any argument with respect to the preceding feature of claim 31, Appellant maintains that the rejection of claim 31 under 35 U.S.C. §102(b) is improper.

Claim 34

Since claim 34 depends from claim 27, which Appellants have argued *supra* to not be unpatentable over Jones, Jr. under 35 U.S.C. §102(b), Appellants maintain that claim 34 is likewise not unpatentable over Jones, Jr. under 35 U.S.C. §102(b).

In addition with respect to claim 34, Jones does not disclose the feature: "wherein the

method further comprises rapidly cooling the programmable element from the elevated temperature to an operating temperature".

Moreover, since the Examiner has not presented any argument with respect to the preceding feature of claim 34, Appellant maintains that the rejection of claim 34 under 35 U.S.C. §102(b) is improper.

Claim 35

Since claim 35 depends from claim 27, which Appellants have argued *supra* to not be unpatentable over Jones, Jr. under 35 U.S.C. §102(b), Appellants maintain that claim 35 is likewise not unpatentable over Jones, Jr. under 35 U.S.C. §102(b).

In addition with respect to claim 35, Jones does not disclose the feature: "wherein the step of forming a layer includes forming a conductive contact within the layer, wherein the conductive contact is in direct mechanical contact with the cap portion and with the semiconductor substrate".

Moreover, since the Examiner has not presented any argument with respect to the preceding feature of claim 35, Appellant maintains that the rejection of claim 35 under 35 U.S.C. §102(b) is improper.

Issue 2

CLAIMS 30, 32-33 AND 36 ARE NOT UNPATENTABLE UNDER 35 U.S.C. §103(a) OVER JONES, JR. ET AL. (U.S. 4,835,118) IN VIEW OF MEHTA ET AL. (U.S. 5,795,627).

The Examiner rejected claims 30, 32-33 and 36 under 35 U.S.C. §103(a) as allegedly being unpatentable over Jones, Jr. et al. (U.S. 4,835,118) in view of Mehta et al. (U.S. 5,795,627).

Since claims 30, 32-33 and 36 depend from claim 27, which Appellants have argued *supra* to not be unpatentable over Jones, Jr. under 35 U.S.C. §102(b), Appellants maintain that claims 30, 32-33 and 36 are likewise not unpatentable over Jones, Jr. in view of Mehta under 35 U.S.C. §103(a).

In addition, Appellants respectively contend that the Examiner's argument for modifying Jones by the alleged teaching in Mehta is not persuasive. The Examiner argues that "Jones, Jr. et al. does not specifically show the wavelength in the range as claimed, the cap portion including silicon dioxide or silicon nitride and providing trench isolation regions. However, Mehta et al. teaches the wavelength in the range as claimed, the cap portion including silicon dioxide or silicon nitride and providing trench isolation regions (col. 3, lines 18-43, col. 5, lines 10-14, col. 7, lines 30-33). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Jones, Jr. et al. reference by including the wavelength, the cap portion including silicon dioxide or silicon nitride and providing the trench isolation regions as taught Mehta et al. in order to avoid damage (Mehta et al., col. 3, lines 18-21)."

In response to the preceding argument by the Examiner, Appellants maintain that Mehta does not teach avoiding damage, as alleged by the Examiner, but rather teaches removing existing damage. Mehta's method for removing the existing damage is totally unrelated to: the

laser wavelength, the silicon dioxide or silicon nitride material of the cap portion, and the trench isolation regions. Mehta teaches that damage is avoided by melting the surface 165 of the semiconductor substrate 170 to a sufficient depth, which is controlled by the energy fluence of the laser beam. In fact, the "cap portion" is not even present when the laser beam of Mehta removes the damage. See Mehta, FIGS. 5-6 and accompanying description on col. 6, line 39 - col. 7, line 3.

Thus, Appellants respectively contend that the Examiner has not established a *prima facie* case of obviousness in relation to claims 30, 32-33 and 36.

SUMMARY

In summary, Appellant respectfully requests reversal of the June 29, 2004 Office Action rejection of claims 27-36.

Respectfully submitted,

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Dated: 11/24/2004

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APPENDIX - CLAIMS ON APPEAL

17. A method of selecting a specific precise resistance in a programmable element that comprises a semiconductor material, said method comprising the steps of:

doping the semiconductor material with a dopant that decreases said resistance when said element is exposed to actinic radiation, said radiation causing substantially no mechanical deformation of said element;

exposing said programmable element to said actinic radiation for a first length of time;

determining a test resistance value of said programmable element;

comparing said test resistance value to said specific precise resistance; and

if said test resistance value does not equal said specific precise resistance, exposing said programmable element to said actinic radiation for said first length of time and repeating said steps of determining and comparing said resistance values.

18. The method of claim 17, wherein the method further comprises the step of forming a layer on the semiconductor material, wherein the layer comprises a cap portion that includes an insulative material such that the cap portion is in direct mechanical contact with the semiconductor material, and wherein during each said exposing the actinic radiation strikes an uncovered surface of the cap portion, passes through the insulative material of the cap portion, and propagates into the programmable element.

19. The method of claim 18, wherein the doping step is performed before the step of forming a layer.

20. The method of claim 18, wherein the doping step is performed after the step of forming a layer.

21. The method of claim 18, wherein the cap portion of the layer includes silicon dioxide.

22. The method of claim 18, wherein the cap portion of the layer includes silicon nitride.

23. The method of claim 18, wherein the step of forming a layer includes forming a conductive contact within the layer such that the contact is in direct mechanical contact with the cap portion and with the semiconductor substrate.

24. The method of claim 17, wherein actinic radiation is laser radiation, and wherein each said

exposing comprises exposing said programmable element with said laser radiation for said first length of time which results in heating said programmable element to an elevated temperature.

25. The method of claim 24, wherein after said comparing determines that the resistance value equals said specific precise resistance, the method further comprises rapidly cooling the programmable element from the elevated temperature to an operating temperature.

26. The method of claim 17, wherein the providing step includes providing shall trench isolation within the semiconductor material for isolating the programmable element within the semiconductor material.

27. A method for programming a programmable element, comprising the steps of:

providing a semiconductor substrate having a semiconductor material therein, wherein the semiconductor substrate includes a programmable element region having the programmable element, and wherein the programmable element comprises the semiconductor material;

doping the programmable element in the programmable element region with a dopant;

forming a layer on the semiconductor substrate, wherein the layer comprises a cap portion that includes an insulative material, and wherein the cap portion is in direct mechanical contact with the semiconductor substrate;

heating the programmable element with laser radiation to an elevated temperature such that the dopant is activated so as to cause an electrical resistance of the programmable element to decrease, wherein the laser radiation strikes an uncovered surface of the cap portion, passes

through the insulative material of the cap portion, and propagates into the programmable element region such that the laser radiation causes substantially no mechanical deformation of the programmable element.

28. The method of claim 27, wherein the doping step is performed before the step of forming a layer.

29. The method of claim 27, wherein the doping step is performed after the step of forming a layer.

30. The method of claim 27, wherein the laser radiation has a wavelength in a range of 248 nanometers to 1107 nanometers.

31. The method of claim 27, wherein the laser radiation has a wavelength such that the laser radiation is essentially unabsorbed by the cap portion of the layer.

32. The method of claim 27, wherein the cap portion of the layer includes silicon dioxide.

33. The method of claim 27, wherein the cap portion of the layer includes silicon nitride.

34. The method of claim 27, wherein the method further comprises rapidly cooling the programmable element from the elevated temperature to an operating temperature.

35. The method of claim 27, wherein the step of forming a layer includes forming a conductive contact within the layer, wherein the conductive contact is in direct mechanical contact with the cap portion and with the semiconductor substrate.

36. The method of claim 27, wherein the providing step includes providing shall trench isolation within the semiconductor substrate for isolating the programmable element region within the semiconductor substrate.